
Detailed Project Report

Aroostook River, Ft. Fairfield, Maine

MAIN REPORT

FILE COPY

Local Flood Protection



US Army Corps
of Engineers
New England Division

DEFINITE PROJECT REPORT
LOCAL FLOOD PROTECTION
AROOSTOOK RIVER
FT. FAIRFIELD, MAINE

REVIEW DRAFT

APRIL 1987

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
A. INTRODUCTION	1
Study Authority	2
Study Area	3
Study Objective	3
Prior Studies	3
Existing Projects	6
B. BACKGROUND INFORMATION	
General	10
Basin Description	10
Climatology	11
Streamflow	11
Flood History	13
Socio-Economic Setting	14
Environmental Setting	16
C. PROBLEM IDENTIFICATION	
Without Project Conditions	17
Problems & Opportunities	19
D. PLAN FORMULATION	
Preliminary Screening of Measures	22
Summary of Preliminary Screening	33
Second-stage Screening	39
Rationale for Selected Plan	36
E. THE SELECTED PLAN	37
Project Description	37
Project Cost	4
Project Operation	43
Project Accomplishments	44
Plan Implementation	46
Public Involvement, Coordination and Comments	47
CONCLUSIONS	48
RECOMMENDATIONS	49
ACKNOWLEDGMENTS	52
ENVIRONMENTAL ASSESSMENT	
APPENDIX 1 - PUBLIC INVOLVEMENT	

LIST OF TABLES

<u>Number</u>		<u>Page</u>
1.	Aroostook River Floods	12
2.	Population Trends	13
3.	Indicators of Economic Well-Being	15
4.	Alternative Flood Control Measures	21
5.	Flood Control Storage Reservoirs	24
6.	Earth Dikes - Pertinent Information	30
7.	Earth Dikes - Economic Analysis	35
8.	Plan Optimization	37
9.	Project costs and Benefits	41
10.	Cost Sharing	45

LIST OF PLATES

<u>Number</u>	
1.	Basin Map
2.	Plan View - Recommended Plan
3.	Typical dike section
4.	Typical dike section

SECTION A

Introduction

INTRODUCTION

This Definite Project Report (DPR) presents the results of investigations of the feasibility of providing local flood protection along the Aroostook River in Fort Fairfield, Maine, and recommends construction of an earth dike flood control plan to reduce the damaging effects of future flooding.

Definite Project Studies were initiated after investigations performed under the Aroostook River Feasibility Study determined that an ~~engineering~~ ^{Q?} and economically justified local protection project at Fort Fairfield, Maine had sufficient local support to warrant further detailed study. The Chairman of the Fort Fairfield Town Council and Town Manager requested (letter dated January 28, 1985) that a study be performed under the Section 205 authority.

The most recent flooding occurred in March 1986. Flood flows in this study area affect a commercial business district, downtown roads and an adjacent railroad located along the Aroostook River.

STUDY AUTHORITY

This report was prepared under the special continuing authority of Section 205 of the 1948 Flood Control Act, as amended.

The amount allotted for a project shall be sufficient to complete Federal participation in the project. Not more than \$5,000,000 shall be allotted under this section for a project at any single locality. The work shall be complete in itself and not commit the United States to any additional improvement to insure its successful operation, except as may result from the normal procedure applying to projects authorized after submissions of preliminary examination and survey reports."

Authorization for the preparation of this Definite Project Report was provided by the Office of the Chief of Engineers on May 3, 1985.

STUDY AREA

The town of Fort Fairfield is located in northern Maine, 10 miles northeast of Presque Isle and adjacent to the United States-Canadian border. The study area includes flood prone commercial and residential properties adjacent to the Aroostook River. The limits of study extend from just downstream of Limestone Road bridge (Route 1A) and continues easterly along Main Street to the intersection of Main and School Streets. The total drainage area of the Aroostook River basin, above Fort Fairfield is 2,230 square miles.

STUDY OBJECTIVE

The Aroostook River Feasibility Study determined that justification exists for Federal participation in the implementation of flood control improvements in Fort Fairfield. The primary objective of this investigation is to expand on the findings of the earlier study and to develop a viable plan for flood control, with sufficient detail for approval, that will reduce future flood damages in Fort Fairfield.

PRIOR STUDIES

Prior Studies, Reports and Existing Water Projects

Within the Aroostook River watershed a number of Federal, State, regional and local agencies have engaged in water resources investigations. The extensive data developed in these prior studies were evaluated and utilized as support in the preparation of the Aroostook River feasibility study which formed the basis for this DPR.

Federal

NENYIAC Report: A report by the New England - New York Inter-Agency Committee (NENYIAC) was completed in March 1955. It contains a comprehensive study of overall water resources problems and opportunities in the Aroostook River watershed, and identifies potential management plans.

North Atlantic Regional Water Resources Study: Published in 1972, this regional study was intended to establish a broad master plan as a basis for regional water and related land resources management. The study's basic finding was that comprehensive management of the area's resources is necessary for wise development of those resources.

Flood Plain Information Studies: Flood plain information studies were completed in June 1978 by the Corps of Engineers for the communities of Caribou, Fort Fairfield, Presque Isle and Washburn. These studies were undertaken to identify flood hazard areas, to alert communities to the flood threat they face, and to provide local officials information for land-use planning.

Cropland Irrigation and Conservation Report: In May 1980, the Corps of Engineers, New England Division, published a report investigating the feasibility of cropland irrigation and conservation practices in the St. John River Basin. The report proposes potential solutions to encourage adoption of such practices, and recommends that a research/demonstration program be pursued by the State of Maine.

Flood Insurance Studies: Flood Insurance Studies have been prepared for Caribou and Fort Fairfield (August 1980) and Presque Isle and Washburn (October 1980). These four communities are presently enrolled in the regular flood insurance program based on flood zones and actuarial rates determined in the flood insurance study.

State

Maine Rivers Study: This study, completed in May 1982, was conducted by the State of Maine, Department of Conservation in conjunction with the U.S. Department of the Interior, National Park Service. The purpose of the study was to identify unique natural and recreation rivers within the State and to identify actions that could be initiated to manage, conserve and enhance the river resources in order to protect those qualities deemed important.

Regional

Aroostook-Prestile Areawide Water Quality Plan: Under Section 208 of the Federal Water Pollution Control Act Amendments of 1972, the Northern Maine Regional Planning Commission (NMRPC) conducted a study of wastewater cleanup for the designated nine community "208" area. The report, published in July 1977, concentrates on control of nonpoint sources of pollution in developing a plan of action.

Northern Maine Non-Designated "208" Area Water Quality

Management Plan: This study, completed in August 1978, was conducted by the NMRPC, and concentrated on the remaining northern Maine area outside of the designated "208" area. The focus of the report is on cleanup of nonpoint sources of pollution, mainly from erosion of agricultural lands and sedimentation.

St. John River Basin Overview: In September 1981, the former New England River Basins Commission (NERBC) published a summary report on the resources, problems, needs and relevant programs and projects for the entire St. John River Basin. The report discusses problems and potential development in several water resources areas for the Aroostook River watershed.

Management Plan for the Aroostook and Machias Rivers: The NMRPC has recently completed a study of potential management strategies for the Machias River and certain reaches of the Aroostook River.

EXISTING WATER PROJECTS

Federal

The U.S. Department of Agriculture Soil Conservation Service has completed several small projects in the Aroostook River watershed. These projects, constructed under authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended, serve a variety of purposes and are identified in the following paragraphs.

a. Libby Brook Watershed: Completed in 1966 the project includes land treatment measures, two structures and diversion channel to prevent flooding of residences and businesses in Fort Fairfield. All of the land treatment measures have been applied. The structures are located in series on the mainstem of Libby Brook and control a total drainage area of about 9.0 square miles. The upstream facility is a multiple-purpose project providing flood control and 27 acres of permanent storage for recreation and fish and wildlife purposes. The downstream structure provides flood control storage and discharges into a 4,000-foot diversion channel that empties into Pattee Brook Pond before entering the Aroostook River below Fort Fairfield.

The existing project provides an estimated 100 percent reduction in average annual floodwater damages and controls approximately 90 percent of the Libby Brook drainage area. The project provides 100-year protection.

b. Limestone Stream Watershed: This project completed in 1977 includes land treatment measures, and three structures to prevent floodwater and sediment damage to agricultural, residential, commercial, industrial, recreational and municipal property. All land treatment measures have been applied. The first structure is a multiple-purpose project providing municipal water supply storage and flood control and is located on Durepo Brook. The next downstream structure is located on Noyes Brook and is a single-purpose flood retarding project.

The third structure is a multiple-purpose project located on Webster Brook that provides a permanent pool of approximately 100 acres for recreation in addition to flood control storage.

Approximately 27 square miles of the 49 square mile drainage area are controlled by the project providing an estimated 97 percent reduction in average annual floodwater damages.

c. Parkhurst Siding - Caribou Watershed: This project, currently authorized for operation, proposes cropland resources management systems to control runoff, reduce erosion, and protect the agricultural resource base throughout the approximately 6 square mile watershed bordering the Aroostook River. Beneficial effects of the project include reduced runoff and erosion that will provide protection to the agricultural resource base, reduced sediment affecting road ditches and culverts, and improved water quality in the Aroostook River.

Long-term (5-10 years) land treatment contracts between local land owners and project sponsors will be implemented to install the proposed conservation practices on approximately 77 percent of the cropland in the watershed.

Non-Federal

There are four projects in the Aroostook River watershed owned or jointly owned and operated by the Maine Public Service Company (MPSCo.). Two of the projects, Caribou Station in

Caribou, Maine, and Tinker Dam in the province of New Brunswick, Canada, are located on the mainstem of the Aroostook River and operated as run-of-river hydroelectric power projects.

The existing Tinker Dam project, owned jointly by MPSCo. and the New Brunswick Electric Power Company, is located downstream of Fort Fairfield, Maine near the confluence of the Aroostook River and the mainstem St. John River. The Aroostook River is dammed upstream of the powerhouse structure allowing flows to pass to the power facilities through a diversion canal. The main dam is equipped with gates to provide increased discharge capacity during emergency conditions.

SECTION B

Background Information

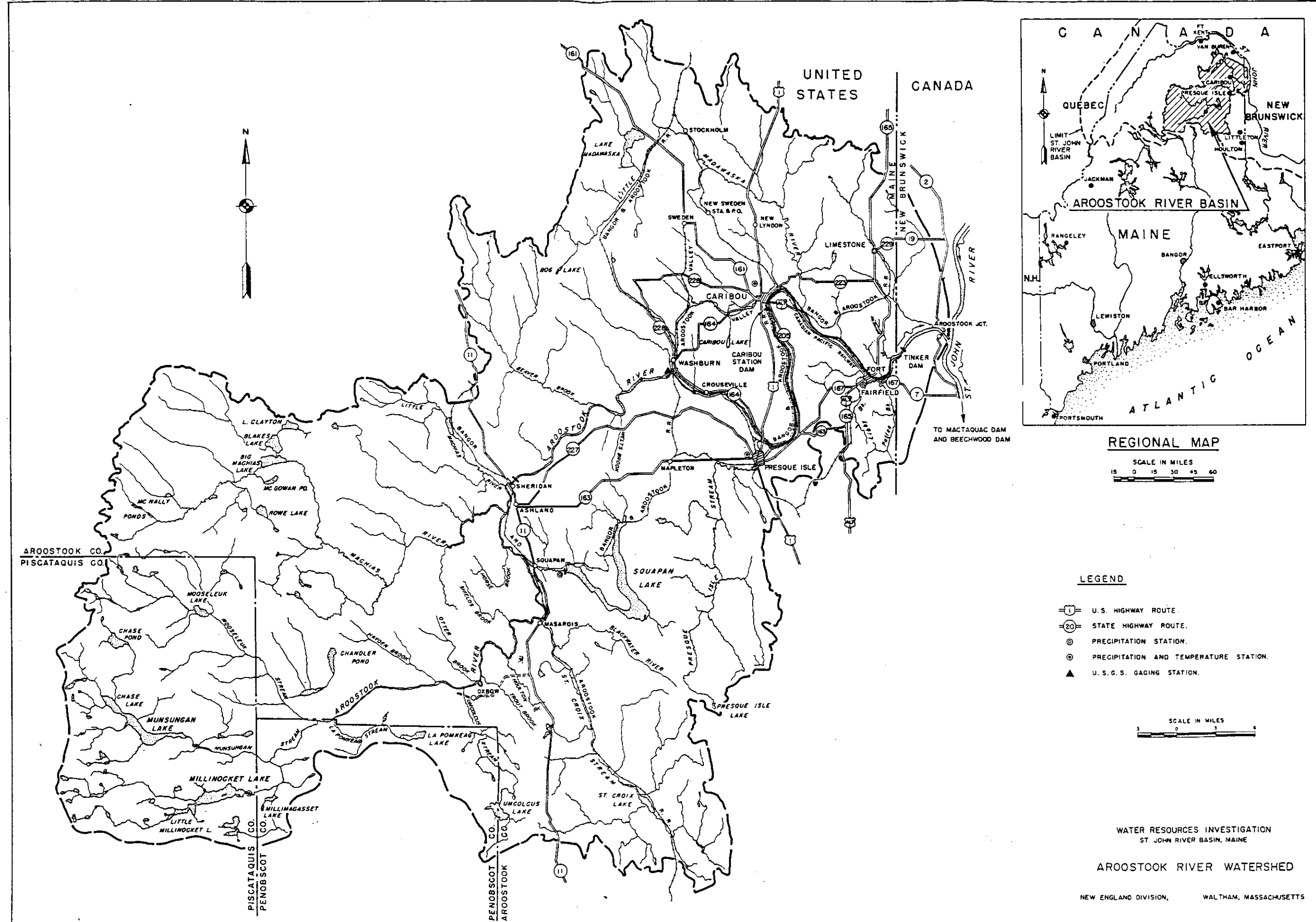
BACKGROUND INFORMATION

GENERAL

The town of Fort Fairfield is located in northern Maine, 10 miles northeast of Presque Isle and adjacent to the U.S.-Canadian border. It is the largest producer of potatoes in the world famous growing region of Aroostook County.

BASIN DESCRIPTION

The Aroostook River is a tributary of the Saint John River in northern Maine and western New Brunswick, Canada, situated between the watersheds of the Penobscot and Allagash Rivers to the west, the Fish River to the north, the Saint John River to the east and the Meduxnekeag River to the south. The Aroostook River forms at the junction of Munsungan and Millinocket Streams in the northwest corner of Penobscot County, Maine, and then flows in a general northeasterly direction for about 100 miles through Aroostook County before crossing the international boundary below Fort Fairfield. The Aroostook River flows about five miles in an easterly direction through New Brunswick to its confluence with the Saint John River at Aroostook Junction in Canada. The drainage area of the basin above Fort Fairfield is approximately 2,230 square miles essentially the entire portion of the basin within Maine. A USGS stream gage upstream in Washburn measures discharges from approximately 1,652 square miles of the basin (see Plate 1).



The upland drainage area is wooded and is used extensively for logging and pulp wood production. The eastern portion of the basin contains practically all the population of the basin and is principally given to agriculture and related industrial activities. The town of Fort Fairfield is located on the international border at river mile 4.5 in one of the most concentrated potato production areas in both Maine and Canada.

CLIMATOLOGY

Mean temperatures in the basin approximate 39 degrees Fahrenheit, with extremes of 97 degrees and -41 degrees Fahrenheit having been measures at Presque Isle. Mean annual precipitation approximates 39 inches which is generally distributed rather uniformly throughout the year; however, approximately 60 percent of the 21.7 inches of mean annual runoff generally occurs in a relatively short 2 to 2-1/2 month period in April, May and June. This is due to the winter snow accumulation/spring melt phenomenon typical of the northern New England climate. Annual snowfall approximates 105 inches.

STREAMFLOW

The large drainage area of the Aroostook River at Fort Fairfield (2,230 square miles) is a hydrologically "sluggish" basin, affecting peak discharges and duration of flooding at Fort Fairfield. Because of the large size of the watershed and its character, several days may pass before effects of heavy rains

cause peak flows in the study reach. In the same manner, severe flood conditions may persist for as much as a week while reservoir, lakes and large tracts of land in the southwestern Aroostook basin drain to normal levels.

The maximum discharge of record (43,100 cubic feet per second) occurred in Washburn on 30 April 1973. During this event, snowmelt as a result of high temperatures combined with 3.06 inches of precipitation between 22 and 30 April produced the peak flow of 43,100 cfs.

The U.S. Geological Survey has recorded flows on the Aroostook River at Washburn, Maine since 1930. Table 1 lists pertinent data for the five greatest flows recorded at the Washburn gage. Flows at Fort Fairfield are generally proportional to those at Washburn by a ratio of drainage area. The estimated peak flows at Fort Fairfield are also listed in Table 1.

TABLE 1
AROOSTOOK RIVER FLOODS OF RECORD
PEAK DISCHARGE IN CFS

<u>Date</u>	<u>Washburn Gage</u> <u>(DA - 1,652 sq. mi.)</u>	<u>Fort Fairfield</u> <u>(DA - 2,230 sq. mi.)</u>
30 Apr 1973	43,100	58,200
2 May 1974	42,500	57,400
22 Mar 1936	37,800	51,000
22 Mar 1939	37,800	51,000
16 May 1961	37,000	50,000

FLOOD HISTORY

Floods along the Aroostook River have occurred to varying degrees over the years resulting from intense rainfall, snowmelt or ice jams or from combinations of the three. The main flood season on the Aroostook River occurs in the spring when heavy rain and snowmelt combine to cause considerable runoff; fall season floods which can occur from rains accompanying coastal hurricanes and tropical storms are generally lower in magnitude than spring floods. Icejams in the Aroostook River are a major flood hazard every spring. Most notable past historic floods are the April 1973 and April 1983 events.

The recent April 3, 1986 ice-out flood stage caused road inundation and inundation of commercial property along Main Street with as much as 3 feet of water at one property.

A recurring April 1973 event in the project study area would cause an estimated \$420,600 in average annual damages to commercial and residential property, the adjacent railroad, and to downtown roads in Fort Fairfield. The April 1973 event had an estimated discharge of 58,200 cfs at Fort Fairfield.

SOCIO-ECONOMIC SETTING

The town of Fort Fairfield is located in Aroostook County, Maine. This county contains more than 20 percent of Maine's land area but only 8 percent of its people. The rural nature of the county is indicated by its population density per square mile of 13.6 compared to 35.3 statewide. The population of Fort Fairfield is 4,376 (1980 U.S. Census). Both the town and Aroostook County have experienced population declines over the past 20 years, while the State of Maine population overall has been growing since 1940.

TABLE 1
POPULATION TRENDS 1960 - 1980

				% Change	% Change
	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1960-1970</u>	<u>1970-1980</u>
Fort Fairfield	5,876	4,859	4,376	-17.3	- 9.9
Aroostook County	106,064	94,078	91,331	-11.3	- 2.9
State of Maine	969,300	993,700	1,124,660	+ 2.5	+13.2

The population declines in Fort Fairfield and Aroostook County can be traced to fewer agricultural jobs due to mechanization and a decline in competitive market position in the potato industry. Other employment sectors are also not providing job opportunities in sufficient numbers to halt emigration of

job-seekers from the county. The increases in population for the State of Maine reflect the growth and development in the southern counties, especially the seacoast communities and those nearby.

The economic well-being of Fort Fairfield inhabitants can be measured by examining per capita income, median family income and percentage of families at or below the poverty level.

TABLE 3
INDICATORS OF ECONOMIC WELL-BEING

	Per Capita <u>Income</u>	Median Family <u>Income</u>	% of Families <u>below Poverty Level</u>
Fort Fairfield	\$4,460	\$14,022	10.2
Aroostook County	\$4,826	\$13,924	13.3
State of Maine	\$5,768	\$16,167	9.8

Fort Fairfield and Aroostook County obviously have income measures below statewide figures because of their rural nature and lack of a strong industrial base. However, Fort Fairfield families do fare slightly better than average county families in terms of median income. Also, while the town's poverty level percentage is nearly that of the State, it is 3 percentage points lower than that of Aroostook County.

According to the 1980 U.S. Census, the Fort Fairfield labor force was 1,735 people of which 1,598 were employed. Of the employing industries, services accounted for the largest share (23%) mostly in health and education. Other major employing industries are: manufacturing (17.5%), agriculture (13.5%), retail trade (13.7%), public administration (7.7%) and construction (6.3%). The majority of employed persons are private wage and salary workers (63%) with the remainder working for Federal, State or local government (26%) or self-employed (11%).

ENVIRONMENTAL SETTING

The proposed project site is located in the lower reach of the Aroostook River about 5 miles upriver of the Tinker Dam at Aroostook Falls, New Brunswick. The Aroostook River in the vicinity of Fort Fairfield is approximately 400 to 600 feet wide.

Overall, the shoreline is relatively exposed. There is little or no evidence of overhangs or other features that would naturally "hold" fish. The vertical relief of the shoreline increases from the downriver portion of the proposed project (relief on the order of 1.5 to 2.0 feet) to the upriver region (on the order of 12 feet).

The shoreline is also characterized by an occasional embankment, steam discharge, or stormwater pipe. For example, Libby Brook passes through Fort Fairfield and discharges to the Aroostook; this occurs just downriver of Smyth's Sub Shop. The sediments in the area of the discharge were heterogeneous.

The original upland vegetation of the basin was spruce/fir forest. Patches of this forest still remain, but in the Fort Fairfield region a majority of the land has been cleared for agriculture. This is particularly true of the richer soils nearer the river. The predominant crop is potatoes, followed by grasslands for cattle or hay.

SECTION C

Problem Identification

PROBLEM IDENTIFICATION

WITHOUT PROJECT CONDITIONS

The following discussion focuses on the most probable future condition of the Aroostook River watershed assuming that no new Federally-sponsored water resources project is developed in the area. This analysis is intended to identify problems of the study area and to serve as a baseline against which the expected impacts of water resources projects can be judged.

Future Population and Economy

The population trend for the State of Maine is increasing and expected to continue in the future. The population in both Ft. Fairfield and Aroostook County have been declining for the past 20 years. This trend is expected to stabilize in the near future. Population in Ft. Fairfield is not projected to increase or decrease significantly in the future.

The future localized economy in Ft. Fairfield would suffer without implementation of the flood control project. Some of the commercial businesses would be forced to relocate if protection is not provided. This could have an effect on the tax base if they don't relocate in town.

Future Flood Losses

In the absence of additional flood control improvements along the Aroostook River, residents and businesses in the flood plain can expect to be threatened with flooding on an annual basis. Major floods, more dangerous in their threat to human health and safety, and more damaging in their destruction to property, will also continue unchecked. In total, there are approximately 15 residential and 30 commercial properties that would be affected during a 100-year flood on the Aroostook River. Flood damage surveys of these properties have been conducted to determine the range of losses likely to occur during all different flood events on the Aroostook River. To facilitate the comparison of alternate flood control improvements these flood losses have been converted to a single estimate of the average loss that could be expected to occur in any given year, referred to as the average annual loss. In January 1987 dollars, average annual flood losses to the Aroostook River properties in the study area are estimated to total \$460,500. If a single flood having a frequency of occurrence of once in 100 years were to occur today, it would result in approximately \$5,159,400 in losses.

PROBLEMS AND OPPORTUNITIES

The problems and opportunities discussed in this section, and the objectives statements which follow, have been identified through an understanding of the existing character of the Aroostook River watershed and through interaction with other Federal, State and local agencies and the general public.

Flooding Problem

Recurring flood events along Aroostook River have resulted in property damage, loss of utilities, and the need for residents to evacuate their homes until access and services are safely restored. Flood losses in the Aroostook River area are estimated to average \$460,500 annually. The magnitude of these losses and the frequency of flooding illustrate the need for a solution for the flooding problem.

Socio-Economic Opportunity

One of the town's objectives is to protect and preserve the existing development and urban environment to ensure a stable future for the town. Providing flood control to those areas susceptible to flood damage in Ft. Fairfield would enhance this objective.

Problem and Opportunity Statements

Based on the above summary of problems and opportunities in the Aroostook River watershed the following statements were developed to guide the formulation of a flood damage reduction project for Fort Fairfield, and to serve as a standard against which the achievements of the alternative plans could be

assessed. Basically, a complete project in the Aroostook River watershed should:

- (1) Reduce the flood hazard and associated urban flood damages along the Aroostook River in Fort Fairfield;
- (2) Maintain and enhance existing open space areas and recreational opportunities in the project area.
- (3) Maintain and protect the historical and cultural attribute of any site discovered within project boundaries that has the potential to be included in the National or State Register of Historic Places.
- (4) Pursue the coordination efforts with other responsible agencies to further address the problems and opportunities of the study area to effect a complete and adequate solution to the flooding problems in Fort Fairfield.

SECTION D

Plan Formulation

PLAN FORMULATION

The draft feasibility study for the St. John River Basin, Aroostook River watershed, identified and investigated the flood control merits of several alternative plans and evaluated their engineering and economic feasibility with respect to local flood protection in Fort Fairfield. The viability of those alternatives ~~have~~ ^{has} been reevaluated under present conditions along with the impact of their implementation and public acceptance. This section describes the range of alternative plans considered and the evaluation process used for screening.

PRELIMINARY SCREENING OF ALTERNATIVES

Flood Protection Measures

Flood protection measures fall into two basic categories: structural and nonstructural. Structural measures are those that reduce overbank flooding, while nonstructural measures reduce or mitigate the damages caused by flooding. The two general categories of flood protection measures are shown in Table # and described in further detail in this section.

TABLE 4

Alternative Flood Protection Measures

- I. Structural - Measures to Reduce Flooding
 - A. Reduce Flooding Prior to Reaching Critical Damage Area
 - 1. Reservoirs
 - 2. Diversions
 - 3. Land Treatment
 - B. Reduce Flooding at Critical Damage Area
 - 1. Levees and Floodwalls
 - 2. Channel Modification
 - 3. Preflood Emergency Flood Fighting
- II. Nonstructural - Measures to Reduce or Mitigate Flood Damage
 - A. Reduce Actual Damages
 - 1. Floodproofing
 - 2. Relocation
 - 3. Land Use Regulations and Zoning
 - 4. Flood Warning and Emergency Evacuation
 - B. Mitigate Damages
 - 1. Flood Insurance

Plan Formulation Rationale

The plan formulation process involves the development and evaluation of those management measures just described. Each measure was assessed in terms of social, environmental and

economic impacts and public acceptance. Some of the above measures were evaluated in other studies and in those cases we have utilized the previous findings. Alternatives that did not address the problems and opportunities of the study area were eliminated. The subsequent sections provide information on plan description, evaluation and comparison which led to the selection of plans warranting more detailed analysis.

Reservoirs

A common method of reducing peak flood flows is to temporarily store flows in an upstream area away from damage areas, and gradually release these flows in a controlled and non-damaging fashion. The Aroostook River feasibility study identified sixteen possible reservoir sites on the mainstem of the Aroostook River and various tributaries. The sixteen sites were evaluated for feasibility as flood control storage sites. Evaluation criteria included drainage area controlled, potential stage reductions in downstream damage areas, suitability of the site for flood control storage, and identification of any factors that would lead to excessive development costs.

A cursory screening of the sixteen potential reservoir sites showed that most were not suitable for flood control storage due to the small drainage areas controlled and distance from downstream damage areas. However, three sites showed some promise and were retained for more detailed investigation. The three sites were identified as Site No. 3, located approximately

7 river miles upstream from the village of Oxbow Site No. 9, located on the Machias River approximately 12 river miles upstream from the Aroostook River, and Masardis, located approximately 7 river miles downstream from the village of Oxbow. Pertinent information on each of the potential reservoir sites is presented in Table 5.

These three sites were subjected to hydrologic and engineering analysis to determine the most feasible alternative. Costs were estimated for each dam using the least costly method of construction meeting Corps criteria and based on preliminary foundation and site information. Flood damage reduction benefits were then developed and an economic analysis performed. None of the three sites ^{was} ~~were~~ found to be economically feasible, and, therefore, the reservoir options were dropped from further consideration.

TABLE 5

Flood Control Storage Reservoirs

	<u>Site No. 3</u>	<u>Masardis</u>	<u>Site No. 9</u>
Drainage Area (mi ²)	458	630	259
Storage (ac-ft)	146,600	201,400	82,300
Surface Area (ac)	5,000	7,800	4,200
Spillway Elev. (NGVD)	687	634	718
Top of Dam (NGVD)	702	649	733
Length of Dam (ft)	1,500	1,750	800
Height of Dam (ft)	80	81	72

Diversions

Diversions are used to divert the flood flows from upstream of a damage area to a point downstream of the area. The flood flows can be conveyed through pipes, tunnels or overflow channels. Diversions are only effective on small watersheds with a high concentration of damages. Because of the size of the watershed and the volume of damaging flood flow, it would not be possible to divert it around the damage area.

Land Treatment

Although adopted primarily to further good agricultural and forestry practices, land treatment and watershed management measures have beneficial effects on flood conditions. Modifying or preserving vegetative cover conserves water by increasing infiltration and reducing surface runoff. The degree to which flood discharges may be influenced varies with the watershed, the characteristics of flood-producing storms and antecedent moisture conditions. However, accelerated runoff is not a significant contributing factor to the severity of flooding in the basin, due to the primarily rural nature of the basin. Thus land treatment measures would do little to control flooding in the basin and were ruled out of further study. However, continued use of these measures by public and private interests is recommended to improve and protect upstream agricultural and forest lands.

Channel Modification

Within a particular flood prone area, floodwaters escape the river channel when the discharge of a particular flood exceeds the carrying capacity of that channel. Accordingly, consideration was given to increasing the channel's flow capacity and removing obstructions to flow, thereby lowering the flood stage associated with a given discharge. Since all channels have a limit to their capacity, residual flooding occurs during events larger than that for which the channel is designed. Channel capacities can be improved by several methods, including widening and deepening the channel, increasing the slope of the channel, or improving the flow characteristics within a given channel.

Due to the already large size of the channel at Fort Fairfield and the limited land available along the river for expansion, it was determined that any effort to widen or deepen the channel would have little effect on current flood stages, and, therefore, channel modifications were not retained for further study.

Small Walls & Levees

Walls and levees (earth dikes) are generally used to prevent floodwaters from entering a damage-prone area. They can be constructed to protect an individual structure or group of structures against damage, and in more comprehensive plans they can be used to confine floodflows to a particular channel.

The draft feasibility study for the St. John River Basin, Aroostook River watershed, identified four alternative proposals for construction of an earth dike at Fort Fairfield. The four proposed plans involved two different dike alignments at both the Standard Project Flood (SPF) and 100-year flood events. The costs developed at that time were updated using the latest ENR, and benefits were reevaluated for both the SPF and 100-year flood. The results indicated that all four plans were economically justified, however, the shorter alignment for both flood events resulted in higher benefit-cost ratios.

Floodwalls were evaluated as part of the St. John River Basin study and eliminated from evaluation since the cost of construction was higher than that of an earth dike. However, subsequent surveys identified additional costs associated with the dike construction that would not be required if a floodwall were constructed, therefore, floodwalls were considered as a potential alternative to the earth dike and were retained for further study.

Preflood Emergency Flood Fighting

When a flood is imminent, the construction of temporary levees can help a community or specific area survive a flood. Successful flood fighting depends upon many variables, including flood characteristics, warning time, the physical nature of the problem area, and the quantity of manpower, supplies and

equipment required. Construction of a temporary levee that would protect against the 10-year flood would require a sizeable commitment of manpower, equipment, and materials. Because of the impracticality of this alternative it was not retained for further study.

Floodproofing

The underlying principle of floodproofing is that structures can be modified so that floodwaters no longer damage contents within the building. In a floodproofing operation, doors and windows are generally sealed to prevent the inflow of floodwaters. However, waterproofing becomes a much more expensive proposition when the walls and foundations themselves are porous, allowing seepage of floodwaters. Further complicating the prospect of floodproofing is the fact that many of the structures in the flood plain are old, and are not designed to withstand the hydrostatic forces that would develop when the building was sealed to act as a flood retarding structure. Since this was considered to be the most common situation in Fort Fairfield, floodproofing was not considered further as a viable alternative.

Removal of Structures from Flood Plain

In cases where floodproofing is not feasible because of the depth of floodwaters and the condition of a structure, the removal of that structure from the flood plain may be the only alternative available to eliminate flood losses. The benefits of relocation plans are calculated as the reduction in costs borne by the general public in providing emergency assistance, shelter and food, and tax dollars spent on flood insurance subsidies to flood prone properties.

Many of the buildings in Fort Fairfield are multi-story or large wood frame structures. Relocation of these buildings would be quite costly and socially disruptive to the downtown area. Therefore, a relocation plan was not considered for further study.

Floodwarning Preparedness

As a last effort to provide some protection against flood losses, automated or nonautomated warning plans can be used to alert citizens of impending flooding so they can evacuate the floodplain for personal safety and secure valuable property against flood damage. Warning systems rely on precipitation and stream gages positioned in the upper basin to monitor rainfall and riverflows, and based on developed floodflow models, predict flood stages in downstream areas. Warning systems are most

valuable for their ability to save lives. Beyond that they can serve to reduce economic losses if residents take precautions to elevate valuable property above the expected flood stage or sandbag access points to their structures. The majority of flood losses, however, would still occur. Under a flood warning alternative, many businesses in Fort Fairfield would still sustain the majority of flood losses and the resulting financial hardships. This is not considered to be an effective solution to the flooding problems of Fort Fairfield and, therefore, is not considered further in this study.

Control Land Use

An important tool in the control of future flood losses is land use planning directed to limit the types of activities located in the floodplain. Fort Fairfield is enrolled in the regular program of flood insurance and the community has accepted the terms for future land use dictated by that program. To insure the success of the flood insurance program the community should adopt a plan for future land use, directing intensive damage-prone development away from the floodplain. In addition, development outside the floodplain should also be carefully planned so as not to increase runoff rates into the river. Implementation of sound land use measures is a community responsibility and is, therefore, not further considered in this study.

Flood Insurance

Ultimately, some properties will never be completely protected against flood damage. For this reason the National Flood Insurance Program has been developed to help compensate flood plain residents for their losses. Although this insurance does not cover all the losses that may occur in a flood, it does cover property damage and loss of personal possessions to a much greater degree than disaster relief. Reimbursement is the primary function of the flood insurance program. However, as a precaution against future increases in flood insurance claims, communities enrolled in the regular program of flood insurance are required to implement land use controls which regulate different types of floodplain development. For example, once a community has been accepted into the regular phase of the Flood Insurance Program, new residential properties constructed in the floodplain must have first floor elevations above the 100-year flood stage, and new commercial and industrial buildings must be floodproofed to the level of the 100-year flood. Of course, no development is allowed to occur within the floodway. Property owners in the floodplain should be encouraged to purchase flood insurance coverage for their property as a precaution against future flood damages. Because new home mortgages and business loans now require that flood insurance protection be obtained for a floodplain property, eventually it is hoped that the majority of floodplain properties will have insurance coverage. Implementation of this program is also a community

responsibility. Inasmuch as flood insurance is presently available to Fort Fairfield flood-prone properties, this measure is considered part of the "without project condition" and was not considered an alternative. In the absence of a flood protection plan that reduces actual damages, purchasing of flood insurance is recommended.

SUMMARY OF PRELIMINARY SCREENING

As a result of the initial screening of available flood control alternatives, two structural measures of flood damage reduction were considered worthy of more detailed review. These two measures, floodwalls and earth dikes are evaluated in the following section.

SECOND STAGE SCREENING

This section describes in detail and further investigates those measures which are considered feasible flood control alternatives for the study area as a result of the preliminary screening.

Three alternatives were evaluated for earth dikes and four alternatives were evaluated for floodwalls. All plans provide protection for a 100-year flood event. Two alignments were considered. Alignment 1 extends from just downstream of the Route 1A bridge and continues easterly along the riverbank, extending to high ground at a point downstream of the railroad station. Alignment 2 begins at the same point but ends just upstream of the railroad station.

Features common to all plans include a pumping station, a pressure conduit, and an interior drainage collection system. Railroad closure structures are included in all plans except the plan which involves raising the railroad tracks. Relocation of an existing 16-inch gravity sewer is required for construction of an earth dike.

Earth Dikes

As discussed above, three alternatives were evaluated for earth dikes. The first two alternatives involved construction of a conventional earth dike along two different alignments. The third alternative involved raising the existing railroad on a new

embankment which would serve as an earth dike. Pertinent information on each plan is provided in Table 6.

TABLE 6

Earth Dike Plans
Pertinent Information

<u>Features</u>	<u>Earth Dike Alignment 1</u>	<u>Earth Dike Alignment 2</u>	<u>Raise RR Tracks</u>
Level of Protection	100-year	100-year	100-year
Freeboard (ft)	3	3	3
Length (ft)	3,100	2,900	3,500
Sewer Relocation (ft)	1,930	1,400	N/A

Table 7 summarizes the economic analysis for each plan. Annual costs/benefits are amortized over a 50-year period at the current interest rate of 8-7/8 percent.

TABLE 7

Economic Analysis, Earth Dike Plans

(\$000)

<u>Plan</u>	<u>First Cost</u>	<u>Annual Cost</u>	<u>Annual Benefits</u>	<u>Net Benefit</u>
Alignment 1	\$4,310	388	425.9	37.9
Alignment 2	3,982	374	425.9	51.9
Raise RR Tracks	4,310	388	425.9	37.9

Floodwalls

Three types of floodwalls were evaluated: T-walls, I-walls, and gravity walls. Each floodwall was designed for the 100-year flood event and included two feet of freeboard. The top elevation varied from 369.5 feet NGVD at the upstream end to 368.5 feet NGVD at the downstream end. Two wall alignments were considered having the same start and end points as the two alignments considered for the earth dike alternatives. Annual benefits were essentially the same as those for the earth dike. An economic analysis was performed and all ^{three} floodwall plans were found to lack economic justification.

Rationale For Selected Plan "CAPS"

Once the most feasible plan was selected, it was necessary to determine the optimum level of protection. To accomplish this, costs for the dike plan were estimated at three levels of protection, the SPF, 100 year and 50 year. A comparison of the annual costs with the annual benefits, as shown in Table 8, indicated the 100 year level of protection is the NED plan.

Construction of a 2,900-foot earth dike was found to be the most economical plan based on the analysis performed as part of the second stage screening process. Implementation of this plan would respond to the flooding problems along the Aroostook River in Fort Fairfield and appears to be acceptable to local officials. Environmental impacts would be minimal. Therefore,

this plan was selected as the flood control plan for which justification exists for Federal participation.

TABLE 1

Plan Optimization

(\$ 000)

Level of	Total	Annual	Annual	Net
<u>Protection</u>	<u>Cost</u>	<u>Cost</u>	<u>Benefit</u>	<u>Benefit</u>
SPF	4,721	435	458.9	23.9
100 year	4,151	384	425.9	41.9
50 year	3,898	361	385.7	24.7

SECTION E

The Selected Plan

SELECTED PLAN

PROJECT DESCRIPTION

The selected plan for local flood protection in Fort Fairfield consists of an earth dike approximately 2,900 feet long with stoplog railroad gates at each end, a 65 cfs capacity pumping station for low level interior drainage behind the dike, and a 4-foot diameter pressure conduit for high level drainage. The dike extends from just downstream of Limestone Road bridge at top elevation 370.8 feet NGVD and continues easterly along the riverbank, extending to high ground at a point just upstream of the railroad station in downtown Fort Fairfield at top elevation 369.0 feet NGVD (see Plate 2). The dike provides flood protection to commercial and residential properties on the north side of Main Street.

The top of dike will vary approximately 15-20 feet above existing ground with a top width of 12 feet. The dike core will be compacted impervious fill. The riverside and landside slopes will be 1 vertical to 2.5 horizontal. The riverside slope will have a dumped gravel toe berm. Stone protection (1.5 feet thick) will be placed on the toe and a 1-foot gravel bedding layer underlain by the compacted impervious fill above the toe berm. Stone sizes will be approximately 1-foot in diameter except at the transition sections where it will be approximately 2 feet in diameter. The landside slope will be protected by 6 inches seeded topsoil and a gravel toe trench (see Plates 3+4).

Design Flood: The selected design flood is the ice-surcharged 1 percent chance (100-year) peak flow, which has an estimated flow of 74,000 cfs at Fort Fairfield.

Design water surface elevations for the 100-year event are 367.4 feet NGVD and 364.2 feet NGVD at the upstream and downstream ends, respectively. Design water surface profiles were computed by backwater calculations using "n" values of 0.03 for the channel and 0.07 for overbank areas. Floodflow velocities through the project reach generally a range from 7 to 11 feet per second with the project, which is not measurably different from existing river velocities without the project.

Level of Protection: The proposed plan would provide flood damage reduction up to the ice-surcharged 1 percent chance (100-year) event to commercial and residential properties, and a railroad located along the Aroostook River in downtown Fort Fairfield. Top elevation of the dike would be 370.5 feet NGVD at the upstream end sloping uniformly to elevation 369.0 at the downstream end. The design top of dike would provide 3 feet of freeboard above the project design flood throughout its length.

The upstream and downstream transitions into highground require crossing the railroad track (see Plate 2). A railroad gate would be provided at each end to maintain the railroad right-of-way.

Interior Drainage: The proposed earth dike will intercept runoff from approximately 242 acres of interior area consisting of residential/commercial areas and farmlands. The interior area was divided into a high level watershed of approximately 122 acres and a low level watershed of approximately 120 acres.

a. High Level Watershed. The high level watershed is situated on the western side of Fort Fairfield consisting of about 60 percent farmlands and 40 percent residential/commercial areas. Interior drainage requirements for this high level watershed consist of a 48-inch diameter pressure conduit extending from upstream of main Street to the Aroostook River, for a total length of about 350 feet. Top elevation of the headwall above Main Street will be 372.0 feet NGVD including 2 feet of freeboard, in order to pass the 1 percent chance discharge of 83 cfs against design river stage. This flow capacity is based on the rational formula using a 1 percent chance 1 hour rainfall of 1.9 inches and a "C" coefficient of 0.36. The upstream invert elevation of the proposed pressure conduit should be 366.0 feet NGVD.

b. Low Level Watershed. The low level watershed is situated in the central part of Fort Fairfield, consisting of about 85 percent moderate business and residential development and 15 percent undeveloped. Interior drainage requirements consist of a 48-inch diameter gated gravity conduit, located at the line of protection with capacity to discharge a minimum of 125 cfs against a normal river stage. This flow capacity is based on

the rational formula using a 1 percent chance 1 hour rainfall of 1.9 inches, and a "C" coefficient of 0.55. An interior pumping station will also be required with a capacity of 65 cfs against design river stage. This pumping capacity is equivalent to a runoff rate of 0.25 inch per hour which is comparable to the maximum average hourly rainfall rate during past historic floods, most notably, the April 1973 and April 1983 events. Both the pumping station and gated gravity conduit will be located adjacent to the proposed line of protection just north of Main Street in the vicinity of the present Libby Brook outlet. Existing lateral drains presently discharging to the river through the line of protection will be intercepted and conveyed to the proposed interior pump station.

Related Improvements: An existing sewerline aligned parallel to the river will be abandoned and a new line relocated away from the alignment of the dike foundation.

PROJECT COST

A cost estimate of the major project elements is presented in Table 9. The selected plan has an estimated first cost of \$3,982,¹⁶⁰~~000~~ and an annual cost of \$384,000 which includes operation and maintenance costs of \$10,000.

TABLE 9

AROOSTOOK RIVER, FT. FAIRFIELD, MAINE

FIRST COSTS AND ANNUAL CHARGES - RECOMMENDED PLAN

TOTAL COST

=====

ITEM	Total Cost	
=====	=====	
Pressure Conduit	\$232,000	
Dike Section	\$1,633,600	
Stop-Log Structures	\$263,300	
Pump Station	\$385,100	
Storm Drains	\$137,800	

Subtotal	\$2,651,800	
Contingency (20%)	\$530,360	

Total Const Cost	\$3,182,160	
Engr. & Design	\$200,000	
Supervision & Admin	\$200,000	
Utility Relocation	\$150,000	
Lands, Easements, ROW	\$250,000	

Total Project Costs	\$3,982,160	
TOTAL PROJECT FIRST COST		\$3,982,160
TOTAL INVESTMENT COST		\$4,151,000
(First Cost & Interest During Const)		

ANNUAL COST

=====

Interest & Amortization	\$374,000
(50 year @ 8-7/8%)	
Operation & Maintenance	\$10,000

TOTAL ANNUAL COST	\$384,000

PROJECT JUSTIFICATION

=====

Annual Benefit	\$425,900
Net Benefit	\$41,900
Benefit-to-Cost Ratio	1.11

NON-FEDERAL COST

=====

Utility Relocation	\$150,000
Lands, Easements, ROW	\$250,000
Cash = to 5% of Total	
Project Cost	\$199,108
Additional Cost (25%)	\$396,432

TOTAL NON-FEDERAL COST	\$995,540

PROJECT OPERATION

The proposed project would involve construction of a dike on the south bank of the Aroostook River to protect commercial and residential properties, and a railroad in downtown Fort Fairfield. Appurtenant improvements include a pressure conduit and a pumping station for interior drainage control. Proposed construction is designed to be complete within itself and does not commit the Federal government to any future work. Upon completion, the project would be turned over to the local sponsor(s) as their responsibility to operate and maintain.

An Operation and Maintenance Manual will be prepared by the New England Division and forwarded to the responsible parties. This manual will reflect the project features, as actually built, and provide direction regarding their proper operation and maintenance.

Estimated annual operation and maintenance costs, included herein, are provided for economic analysis only. The local sponsor(s) should be aware that their responsibility includes future funding of all operation, maintenance, and replacement items which should be budgeted for accordingly.

To insure proper operation, maintenance and replacement, as necessary, as prescribed by the Secretary of the Army, the completed project would be inspected semi-annually by personnel from the New England Division, together with other responsible parties.

The local sponsor(s) would be required to maintain dike grass slopes and perform periodic maintenance and testing of pumping station and equipment. Areas of proposed riprap protection would require periodic maintenance to control vegetation and replace any rocks that are dislodged by flooding, vandalism, or other means.

Operation and maintenance costs are estimated to be \$10,000 annually for the proposed flood control works.

PROJECT ACCOMPLISHMENTS

The plan of improvement would provide protection against a one percent (100-year) frequency project design flood discharge of 74,000 cfs, plus design freeboard.

The proposed project for the downtown Fort Fairfield area would reduce annual flood losses from \$460,500 to \$34,500 providing an annual flood damage reduction benefit of \$425,900.

Economic Evaluation

The proposed plan of improvements for the Aroostook River would have a benefit-cost ratio of 1.11 to 1. Estimated annual benefits are \$425,900. Annual costs are \$384,000, and have been

determined by amortizing the project investment costs over a 50-year project life at an interest rate of 8-7/8 percent and adding in annual operation and maintenance costs of \$10,000.

Cost Allocation

The sole purpose of the proposed project is flood damage reduction and all costs have been allocated as such. Under current cost-sharing requirements for Section 205 local protection projects, the local sponsor of the project must provide lands, easements, rights-of-way and utility relocations required for the project and assume responsibility for operation and maintenance of the project after it is constructed. This division of cost responsibilities is established by Section 3 of the 1936 Flood Control Act, as amended. Table 10 below presents a division of project costs between the Federal and non-Federal sponsor, based on current cost-sharing policies.

~~TRADITIONAL~~ TABLE 10
COST SHARING FOR SELECTED PLAN

	<u>TOTAL PROJECT COSTS</u>	<u>PERCENT OF TOTAL</u>
FEDERAL	\$2,986,620	75
NON-FEDERAL	\$ 995,540	25
TOTAL	\$3,982,160	100

PLAN IMPLEMENTATION

Following the review and approval of this document by the Chief of Engineers (COE) and the allocation of funds, plans and specifications for the project features will be prepared.

During the preparation of plans and specifications the town of Fort Fairfield and the State of Maine would be required to sign a formal document reaffirming their support for the project and their intent to fulfill the items of local cooperation.

Following the receipt of these formal assurances and approval of project funding by the Assistant Secretary of the Army, the COE approves project construction. After allocation of construction funds, the Corps would invite bids for the award of a contract for construction of the project. Current policy on construction financing of small flood control projects requires a 5 percent cash contribution from the non-Federal sponsor to be applied to the non-Federal share of project costs.

It is anticipated that the preparation of plans and specifications would be completed by the spring of 1988 and contingent upon the availability of funding and receipt of local assurances, work could begin during the summer of 1988. Duration of construction is expected to be approximately 2.5 years.

PUBLIC INVOLVEMENT, COORDINATION, AND COMMENTS

An active public involvement program has been maintained throughout this detailed study phase with local and State officials. Coordination has also been maintained with other Federal agencies. State and Federal historic and environmental agencies have been informed of the potential plans being considered. A complete public involvement appendix, including pertinent correspondence, will be included in the Detailed Project Report following the 60-day public review period.

CONCLUSIONS

This study was accomplished under authority contained in Section 205 of the 1948 Flood Control Act, as amended. The proposed project is complete within itself and would not require additional work to insure its successful operation.

The selected plan will provide riverfront properties along the Aroostook River with the much needed protection from future flood losses. The plan involves dike construction to include a pumping station and 48 inch diameter pressure conduit for interior drainage. The best indication of the protection offered by the proposed project would be its effectiveness in reducing the expected annual flood losses. It is estimated that the proposed project would reduce annual flood losses in the project area by over 92 percent.

The proposed project would stabilize and increase the economic strength of the community by reducing the risks of future flood losses. A "Finding of No Significant Impact" is contained in the Environmental Assessment.

RECOMMENDATIONS

Final recommendations will be based on comments received during the 60-day public review period and the willingness on the part of the non-Federal sponsor to provide local assurances. Items of local cooperation would include the following:

- a. Hold and save the United States free from damages due to the construction, operation, and maintenance of the project except where such damages are due to the fault of the United States or its contractors.
- b. Maintain and operate the project after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army. This subparagraph shall be construed to apply to all aspects of the project, including lands acquired within the floodplain which must be maintained in a manner that prevents future encroachment which might interfere with proper floodplain management and the functioning of the project for flood control. Annual operation and maintenance costs are currently estimated at \$10,000.
- c. Assume full responsibility for all project costs in excess of the Federal statutory limitation of \$5,000,000 which includes costs of all investigations, planning, engineering, supervision, inspection, and administration involved in development and project implementation. Total Federal participation, including

investigations and planning costs is estimated at \$2,986,600. All costs shall be computed on the basis of actual costs at the completion of the project and not on the basis of estimates contained in this report.

d. Comply with the requirements of non-Federal cooperation specified in Sections 210 and 305 of Public Law 91-646 approved 2 January 1971 entitled the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

e. Comply with Section 601 Title VI of the Civil Rights Act of 1964 (Public Law 88-352) to the end that no person shall be excluded from participation in, denied the benefits of or subjected to discrimination in connection with the project on the grounds of race, creed, or national origin.

f. (1) Provide, without cost to the United States, all lands, easements and rights-of-way necessary for project construction.

(2) Provide the cash contribution of 5 percent of the total non-Federal share of project costs in accordance with current policy for construction financing of flood control projects.

g. Accomplish without cost to the United States all alterations and relocations of buildings, streets, storm drains, utilities, highway bridges, and other structures made necessary by construction of the project.

h. Prevent future encroachment which interfere with proper functioning of the project.

i. Twice yearly inform residents and property owners within the Aroostook River floodplain of the limitations of the flood control improvements and alert them to the continued threat of major flooding along the river.

ACKNOWLEDGEMENTS

This report was completed by the New England Division Army Corps of Engineers, under the general direction of Colonel Thomas A. Rhen, Division Engineer. It was prepared by Project Manager, under the supervision of Mr. F. William Swaine, Chief, Plan Formulation Branch, Mr. Robert G. Martin, Chief, Special Programs Section, and Mr. Joseph L. Ignazio, Chief, Planning Division.

Members of the study team included:

Mr. Robert LeBlanc	Engineering Design Branch
Mr. William Holtham	Engineering Design Branch
Ms. Debra Strickland	Water Control Branch
Mr. Paul Marinelli	Water Control Branch
Mr. Paul Schimelfenyg	Geotechnical Engineering Branch
Mr. Edward Fallon	Real Estate Division
Mr. Marianne Methany	Impact Analysis Branch
Mr. Richard Ring	Impact Analysis Branch
Mr. David Tomey	Impact Analysis Branch
Ms. Lauren Colt	Plan Formulation Branch

SECTION D

SOCIAL AND ECONOMIC ANALYSIS

FORT FAIRFIELD, ME
ECONOMIC ANALYSIS

<u>Table of Contents</u>	<u>Page No.</u>
Introduction	1
Socio-Economic Setting	1
Study Area	2
Valuation of Properties in the Study Area	3
Flood Damage Surveys	3
Recent and Planned Improvements in Study Area	4
Susceptibility to Flooding	4
Recurring Losses	5
Annual Losses	5
Economic Benefit Analysis	6
Inundation Reduction Benefit	6
Improvement Plans Evaluated	7
Benefit Estimation	7
Reduced Pumping Costs	7
Reduction in Flood Insurance Overhead Costs	8
Summary of Benefits	8
Economic Justification	9

Introduction

The purpose of this section is to measure the beneficial contributions to national economic development that are associated with the water resources improvement plans for the Fort Fairfield floodplain. The extent to which the flood control needs of the area are met by the plans will be determined by estimating the dollar value of inundation reduction benefits produced by the plans. Explanatory rationale and supporting documentation will be presented. The measure of each plan's economic justification is the benefit-cost ratio, which is calculated by dividing the dollar value of the total annual benefits to be realized over the plan's economic life by the annual charges for the plan's total cost. A benefit-cost ratio of 1.0 or greater is necessary for Federal participation in water resources improvement projects. Simply, one dollar's worth or more of flood reduction benefits is required for each dollar to be expended on project construction. If more than one plan of improvement has a benefit-cost ratio greater than 1.0 then the plan with the greatest amount of net benefits (ie. total annual benefits minus total annual costs) is chosen. The plan which maximizes net benefits allocates limited resources in the most efficient manner and provides the greatest return on public investment. The analysis contained in this section was performed in accordance with Economic Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Water Resources Council, 1983. Dollar values stated in this section reflect the December 1986 price level. Discounting and amortization was performed at 8-7/8 percent, the current interest rate for Federal water resources improvement project evaluation.

Socio-Economic Setting

The town of Fort Fairfield is located in Aroostook County, Maine. This county contains more than 20 percent of Maine's land area but only 8 percent of its people. The rural nature of the county is indicated by its population density per square mile of 13.6 compared to 35.3 statewide. The population of Fort Fairfield is 4,376 (1980 U.S. Census). Both the town and Aroostook County have experienced population declines over the past 20 years, while the state of Maine population overall has been growing since 1940.

TABLE 1
POPULATION TRENDS 1960 - 1980

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>% Change 1960-1970</u>	<u>% Change 1970-1980</u>
Fort Fairfield	5,876	4,859	4,376	-17.3	-9.9
Aroostook County	106,064	94,078	91,331	-11.3	-2.9
State of Maine	969,300	993,700	1,124,660	+2.5	+13.2

The population declines in Fort Fairfield and Aroostook County can be traced to fewer agricultural jobs due to mechanization and a decline in competitive market position in the potato industry. Other employment sectors are also not providing job opportunities in sufficient numbers to halt emigration of job-seekers from the county. The increases in population for the state of Maine reflect the growth and development in the southern counties, especially the seacoast communities and those nearby.

The economic well-being of Fort Fairfield inhabitants can be measured by examining per capita income, median family income and percentage of families at or below the poverty level.

TABLE 2
INDICATORS OF ECONOMIC WELL-BEING

	<u>Per Capita Income</u>	<u>Median Family Income</u>	<u>% of Families below Poverty Level</u>
Fort Fairfield	\$4,460	\$14,022	10.2%
Aroostook County	\$4,826	\$13,924	13.3%
State of Maine	\$5,768	\$16,167	9.8%

Fort Fairfield and Aroostook County obviously have income measures below statewide figures because of their rural nature and lack of a strong industrial base. However, Fort Fairfield families do fare slightly better than average county families in terms of median income. Also, while the town's poverty level percentage is nearly that of the state it is 3 percentage points lower than that of Aroostook County.

According to the 1980 U.S. Census, the Fort Fairfield labor force was 1,735 people of which 1,598 were employed. Of the employing industries, services accounted for the largest share (23%) mostly in health and education. Other major employing industries are: manufacturing (17.5%), agriculture (13.5%), retail trade (13.7%), public administration (7.7%) and construction (6.3%). The majority of employed persons are private wage and salary workers (63%) with the remainder working for Federal, state or local government (26%) or self-employed (11%).

Study Area

The actual study area is comprised of approximately 25 acres along both sides of Main Street in the commercial district of Fort Fairfield. Main Street is located adjacent to the Aroostook River and its low-lying one-half mile stretch between Peterson's Garage and the Canadian Pacific Railroad Office has been the scene of many floods. Most of the flooding occurs during the springtime because of snowmelt and in many instances is exacerbated by ice jams.

The character of the study area is mostly commercial, however, there is a concentration of senior citizen housing units. There are 30 commercial structures in the area which house 41 separate commercial activities, 4 fraternal organizations and one government agency. Of these 30 structures, 5 have apartments on the second story and one has a total of 25 apartments on its second and third stories. There is only one traditional two-story, two-family house in the study area, but there are two senior citizen housing complexes. The first, Northern House, is a 3-story structure which contains 26 apartments. The second is the Fields Lane Senior Citizen Complex and is operated by the Housing Authority of Fort Fairfield. The complex is a campus type layout with 9 detached structures accounting for a total of 40 units plus a community center. Rounding out the structural inventory of the study area are two government buildings, one the U.S. Post Office and the other the Fort Fairfield Municipal Building which is occupied by town offices, the Police Department and Fire Department.

Valuation of Properties in the Study Area

In November 1986 the Town of Fort Fairfield provided the total value, based on Town Assessor's records, of the properties in the Main Street study area. The value of land is \$502,860 and buildings is \$3,641,000 for a total value of \$4,143,860. Town officials indicate that this figure is roughly 94 percent of current market value.

Flood Damage Surveys

Flood damage surveys are performed at the start of every Corps of Engineers flood control study in order to determine the need for improvements by estimating the magnitude of potential flood-related losses. These losses are estimated, at each flood-prone structure and site, starting at the elevation at which flooding and damage begins up to the elevation of floodwater associated with a very rare event such as the 500 year storm. Damages are estimated in one-foot increments between these two limits. The categories of these losses are: commercial, industrial, residential, agricultural and public. The two types of losses are physical and non-physical. Physical losses relate to grounds, site, structure, contents, utilities and clean-up. Non-physical losses are those additional induced costs which result from loss of use of a flooded structure. Residential non-physical losses are the costs of food, lodging and necessities while unable to use one's residence. For commercial and industrial firms non-physical losses are measures such as lost income and profit while shut down plus the cost of temporary quarters and services. In addition to the structure-related loss categories above, the flood damage survey estimation process also covers two general loss categories: (i) cost of emergency services and (ii) damages and costs to transportation, communication and utility systems.

The first flood damage survey of the Fort Fairfield study area was performed in October 1977 by a private consulting engineering firm as part

of the larger St. John River Basin study. In October 1982, damage evaluators from the New England Division performed a major on-site update. Updates have been performed recently in November 1985 and December 1986 to document improvements which have taken place in the study area.

Recent and Planned Improvements in Study Area

In 1985 the State of Maine awarded a Community Development Block Grant in the amount of \$820,000 to fund the 2-year Fort Fairfield Downtown Revitalization Project. Under this project certain commercial buildings were renovated and expanded and some older buildings were razed. Private investment in the study area was also made during 1986. The Irving Oil Co. constructed a large gas station, grocery store and liquor store. In 1987, the State of Maine, Department of Transportation plans to completely excavate and construct a new roadway and sidewalks for Main Street in the study area. Other improvements for Main Street scheduled for 1987 are: (i) the installation of 125 new street lights, (ii) installation of a new 8 inch sanitary sewer line (1600 linear feet) with manholes and service extensions and (iii) reinforcement of the existing telephone system, both underground and aerial, along Main Street by New England Telephone. The total cost for these 4 scheduled improvements is \$1,500,000.

Susceptibility to Flooding

One indicator of an area's susceptibility to damage from flooding is the relationship of the first floor elevation of structures in the floodplain to the elevation of floodwaters from certain events. First floor elevations were obtained for all floodplain structures by a field survey crew and potential flood elevations were obtained from an "elevation vs. frequency" curve produced by the Water Control Branch (Hydrologic Engineering Section) of the New England Division. The summary table below shows the relationship between flood elevation, frequency and number of structures affected. The salient point of the table is that even a storm of 10 year frequency will produce a flood level that will cover the first floor of 25 of the 43 floodplain structures.

TABLE 1
STRUCTURES SUSCEPTIBLE TO FIRST-FLOOR FLOODING
FORT FAIRFIELD STUDY AREA

<u>Event</u> <u>(year)</u>	<u>Annual % Chance</u> <u>of Occurrence</u>	<u>Flood</u> <u>Elevation</u> <u>(NGVD)</u>	<u>Structures w/ First Floor Flooding</u>	
			<u>Number</u>	<u>% of Total</u>
100 yr.	1%	367.3'	37	86%
50 yr.	2%	366.4'	33	77%
10 yr.	10%	363.9'	25	58%

Recurring Losses

Recurring losses are those potential flood related losses which are expected to occur at various stages of flooding under present day development conditions. Table 2 below displays the dollar value of potential flood-related losses, by damage category, that are estimated to occur if that specific flooding event were to occur today.

TABLE 2
RECURRING FLOOD LOSSES
FORT FAIRFIELD STUDY AREA

Category	10 Year Event (el. 363.9')	50 Year Event (el. 366.4')	100 Year Event (el. 367.3')	500 Year Event (el. 369.2')
Properties	\$1,107,000	\$3,592,000	\$4,678,000	\$6,795,000
Emergency Costs	14,800	24,600	33,800	53,200
Downtown Roads	20,000	239,400	273,100	273,100
Railroads	87,300	174,500	174,500	174,500
Total Losses	\$1,229,100	\$4,030,500	\$5,159,400	\$7,295,800

Annual Losses

Recurring losses, discussed above, are informative inasmuch as they relate the dollar value of flood losses to specific depths of flooding, however they don't offer any information as to what the chances are of those flooding depths occurring in any given year. For the purpose of determining the severity of potential flooding the statistical concept of expected value is employed. For flood control studies the term used to measure the severity of potential flooding on an annual basis is "annual losses." Annual losses are calculated by integrating two sets of data: (i) recurring losses displayed in one-foot increments of flood depth from start of damage to the 500 year storm elevation and (ii) the estimated annual percent chance that flooding will reach each specific elevation for which recurring losses were estimated. Recurring losses are obtained by the flood damage survey process and the annual percent chance of occurrence for each event is obtained from a stage-frequency curve. This curve, estimated by the Hydrologic Engineering Section at NED, displays flood stages on the X-axis and the annual percent chance of reaching that stage on the Y-axis. Annual losses are computed for each event from the one that first causes damage to the 500 year event. Losses for all events are aggregated and this total estimate of expected annual losses represents the degree of flooding severity in the study area. The effectiveness of each alternative plan that is formulated for flood reduction is measured by the extent to which it reduces annual losses. Annual losses, by category, for the Fort Fairfield study area are displayed in Table 3.

TABLE 3
ANNUAL LOSSES
FORT FAIRFIELD STUDY AREA

<u>Category</u>	<u>Annual Losses</u>
Properties	\$398,400
Emergency Costs	2,800
Downtown Roads	12,300
Railroads	47,000
Total	\$460,500

Economic Benefit Analysis

Benefits from plans for reducing flood hazards accrue primarily through the reduction in actual or potential damages associated with land use. Benefits fall into three categories reflecting different responses to a flood hazard reduction plan. The inundation reduction benefit accrues when land use is the same with or without the plan and is defined as the increased net income generated by that use. The intensification benefit also accrues when land use is unchanged and is defined as the increase in net income based on a modification of the method of operation by floodplain occupants because of the plan. The location benefit accrues when an activity is added to the floodplain because of a plan and is measured as the difference between aggregate net incomes in the economically affected area with and without the plan.

Under the "with plan" condition for the Fort Fairfield study area, land use is projected to remain essentially the same. Since the area is the center of commercial activity and has a considerable number of permanent elderly housing units, it is projected that these functions will continue into the foreseeable future. This projection is nearly irrefutable based on the public and private investments in the area's infrastructure and commercial activities during 1985 to 1987. There probably will be modifications to existing activities and development on some of the few vacant lots, with the plan, but it is not expected to be on a large enough scale to significantly affect future losses and benefits. Therefore, benefits which accrue to the improvement plans will be measured under the category of inundation reduction only.

Inundation Reduction Benefit

The increase in net income that accrues under this category is measured by the decrease in the dollar value of outlays associated with reduced flood losses. The national economic development (NED) objective is satisfied if an improvement plan produces the beneficial impact of reducing annual losses.

Improvement Plans Evaluated

Three improvement plans, each offering a different level of protection, were evaluated. All three plans involve a 3000 foot long earthen dike which would extend from just upstream of Peterson's Repair Garage downstream to the Canadian Pacific Railroad Office. The plans to be evaluated offer flood protection against the following 3 events: (i) 500 year, (ii) 100 year and (iii) 50 year.

Benefit Estimation

Benefits for inundation reduction were calculated based on the flood elevation corresponding to each event. The top elevation of each dike plan is that flood elevation plus an additional 3 feet of freeboard to account for wave run-up and wind effects. Corps of Engineers regulations allow benefits to be taken up to the top of the dike plus 50 percent (1.5 feet) of the freeboard range. The benefits to each plan are the summation of annual losses prevented by the dike taken to an elevation 1.5 feet below the absolute top of dike including freeboard. The benefits for each plan are enumerated in Table 4.

TABLE 4
ANNUAL BENEFITS - INUNDATION REDUCTION
FORT FAIRFIELD STUDY AREA

<u>Category</u>	<u>Annual Inundation Reduction Benefits</u>		
	<u>Level of Protection</u>		
	<u>500 Year</u> <u>(el. 369.5')</u>	<u>100 Year</u> <u>(el. 368')</u>	<u>50 Year</u> <u>(el. 367')</u>
Properties	\$387,400	\$362,200	\$327,000
Emergency Costs	2,800	2,600	2,300
Downtown Roads	11,900	10,700	8,900
Railroads	46,600	46,000	44,800
Total	\$448,700	\$421,500	\$383,700

Reduced Pumping Costs

A second type of flood related cost that will be reduced by the dike plan is the increased pumping costs at the Fort Fairfield Sewage Treatment Plant during times of flooding. There is a sewer pipe which runs along the entire length of the site where the dike would be constructed. This pipe would require relocation closer to Main Street, away from the river bank if the dike were to be constructed. In order to determine if economic benefits would accrue to this relocation, the manager of the Fort Fairfield Utilities District was interviewed. The pipe does not currently sustain direct damage from flooding or erosion. It was installed in 1976, is made of PVC, is buried 13 to 17 feet below ground and has an expected life of 60 years. However, during periods of flooding at the pipe's

location, especially in springtime, inflow and infiltration of floodwaters into the pipe occurs at manholes and around some pipe joints. Pumping at the treatment plant increases dramatically from an average of 0.4 MGD to 1.5 MGD during times when floodwaters enter the system and continues at the elevated rate for 2 weeks after flooding subsides. There are two negative effects caused by this inflow. First, the pumping system is overburdened and must pump flood water that doesn't need treatment. Because of this, untreated sewage also gets pumped into the river. The Utilities District is currently under a consent decree from the Maine Department of Environmental Protection to control the inflow. Secondly, the increased volume which needs to be pumped during times of flooding increases the pumping costs. Under the with-plan condition, the section of pipe where inflow and infiltration occurs will be relocated to the inside of the dike, closer to Main Street and further away from the river-bank. The manager of the Utilities District indicates that this relocation of the pipe should solve the inflow/infiltration problem as the manholes will be in the flood protection area. The pumping plant will not be overburdened, pumping costs will remain at normal levels, and untreated sewage will not be pumped into the river, thereby keeping the Utility District in compliance with its State and Federal licenses. The benefit to be realized with the project is estimated to be \$2,000 annually in reduced pumping and associated repair costs.

Reduction in Flood Insurance Overhead Costs

A cost of floodplain occupancy is flood insurance overhead costs. This administrative cost is national in nature and will be eliminated with the 500 year and 100 year dike improvement plans. The 1986 overhead cost per policy is \$67 and an estimated 36 policies are in effect in the study area. With the improvement plan the annual benefit is \$2,400.

Summary of Benefits

The annual benefits expected to accrue under each of the 3 flood protection plans are exhibited in Table 5 below.

TABLE 5
SUMMARY OF ECONOMIC BENEFITS
FORT FAIRFIELD FLOOD REDUCTION PLANS

<u>Category</u>	<u>500 Year Protection</u>	<u>Annual Benefits 100 Year Protection</u>	<u>50 Year Protection</u>
Inundation Reduction:			
Properties	\$387,400	\$362,200	\$327,700
Emergency Costs	2,800	2,600	2,300
Downtown Roads	11,900	10,700	8,900
Railroads	46,600	46,000	44,800
Reduced Pumping Costs (Sewage Treatment Plant)	2,000	2,000	2,000
Reduction in Flood Insurance Overhead Costs	2,400	2,400	-
TOTAL BENEFITS	\$453,100	\$425,900	\$385,700

Economic Justification

The ultimate purpose of the economic analysis is to compare the benefits estimated for each plan to the annual costs of plan implementation in order to determine the benefit-cost ratio which is the measure of economic justification and indicator of Federal participation.

TABLE 6
ECONOMIC EVALUATION OF PLANS

	<u>500 Year Protection</u>	<u>100 Year Protection</u>	<u>50 Year Protection</u>
Total Annual Benefits	\$453,100	\$425,900	\$385,700
Total Annual Costs	\$435,000	\$385,000	\$361,000
Benefit-Cost Ratio	1.04	1.11	1.07
Net Benefits	\$18,100	\$41,900	\$24,700

SECTION E

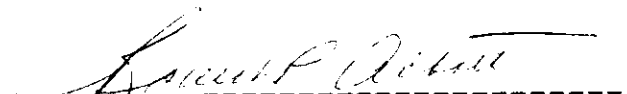
REAL ESTATE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154-9149

PRELIMINARY ESTIMATE OF REAL ESTATE COSTS
FORT FAIRFIELD LOCAL PROTECTION PROJECT
AROOSTOOK RIVER, FORT FAIRFIELD, MAINE

May 1987

PREPARED BY:


ROBERT P. ABBOTT
Staff Appraiser

REVIEWED &
APPROVED BY:

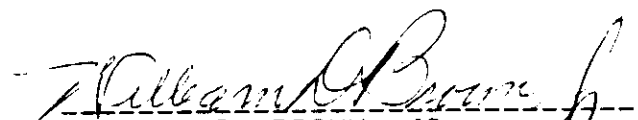

WILLIAM D. BROWN, JR.
Chief, Appraisal Branch

TABLE OF CONTENTS

ITEMS	PAGE
PURPOSE	1
INSPECTION OF THE REAL ESTATE	1
LOCATION & AREA DATA	1
HISTORY	1
PROJECT DESCRIPTION	2
TAX LOSS	2
ACQUISITION COSTS	2
RELOCATION COSTS	3
SEVERANCE DAMAGE	3
PROTECTION AND ENHANCEMENT OF CULTURAL ENVIRONMENT	4
ZONING	4
HIGHEST AND BEST USE	4
MINERAL DEPOSIT	4
CROPS	4
UTILITIES & SERVICES	4
WATER RIGHTS	4 & 5
BORROW AREA	5
RELOCATIONS - ROADS AND PUBLIC UTILITIES	5
CONTINGENCIES	5
GOVERNMENT-OWNED FACILITIES	5
RIGHTS TO BE ACQUIRED	5
FEE REQUIREMENTS	5 & 6
BASEMENT AREAS (PERMANENT & TEMPORARY & EXISTING)	6 & 7
EVALUATION AND CONCLUSION	7 & 8
GROSS APPRAISAL	8
COST SUMMARY	9
ADDENDA	10
COMPARABLE SALES CHARTS	11
COMPARABLE MAP	12

1. PURPOSE

The purpose of this report is to estimate the preliminary real estate cost associated with the Fort Fairfield Flood Control Project located in Fort Fairfield, Aroostook County, Maine.

2. INSPECTION OF THE REAL ESTATE

The properties affected by the proposed project were inspected/viewed in the field in May, 1987, by Staff Appraiser Robert P. Abbott, of New England Division, Corps of Engineers.

3. LOCATION AND AREA DATA

Fort Fairfield is located near the Canadian Border in northeastern Maine on the southern bank of the Aroostook River. The Great Atlantic & Pacific Tea Co. operates a \$3.6 million dollar potato and pea processing plant in Fort Fairfield that employs approximately 200 people.

The area is serviced by U.S. Highway 1A and State Highway 167 in addition to two railroads, the Canadian Pacific and the Bangor & Aroostook. At present, Fort Fairfield is a progressive agricultural community.

4. HISTORY

Floods along the Aroostook River have occurred to varying degrees over the years resulting from intense rainfall, snowmelt and ice jams or from combinations of the three. The main flood season on the Aroostook River occurs in the spring when heavy rain accompanied by snowmelt combined to cause considerable runoff; fall season floods which can occur from rains accompanying coastal hurricanes and tropical storms are generally lower in magnitude than spring floods. Ice jams in the Aroostook River cause a major flood hazards most every spring. Most notable past historic floods are the April 1973 and April 1983 events.

The recent April 3, 1986 ice-out flood stage caused road inundation and flooding of commercial property along Main Street with as much as 3 feet of water at one property.

According to local officials and historical records, a recurring April 1973 event in the project study area would cause an estimated \$500,000 in average annual damages to commercial and residential property, the adjacent railroad, and to downtown streets in Fort Fairfield. The April 1973 event had an estimated discharge of 58,200 cfs at Fort Fairfield.

5. PROJECT DESCRIPTION

The selected plan for local flood protection in Fort Fairfield consists of an earth dike approximately 2,900 feet long with stoplog railroad gates at each end, a 65 cfs capacity pumping station for low level interior drainage behind the dike, and a 4-foot diameter pressure conduit for high level drainage. The dike extends from just downstream of Limestone Road bridge at top elevation 370.5 feet NGVD and continues easterly along the riverbank, extending to high ground at a point just upstream of the railroad station in downtown Fort Fairfield at top elevation 369.0 feet NGVD. The dike should provide flood protection to commercial and residential properties on the north side of Main Street. (See Plate 7)

The top of dike will vary approximately 15-20 feet above existing ground with a top width of 12 feet. The dike core will be compacted impervious fill. The riverside and landside slopes will be 1 vertical to 2.5 horizontal. The riverside slope will have a dumped gravel toe berm. Stone protection (1.5 feet thick) will be placed on the toe and a 1-foot gravel bedding layer underlain by the compacted impervious fill above the toe berm. Stone sizes will be approximately 1-foot in diameter except at the transition sections where it will be approximately 2 feet in diameter. The landslide slope will be protected by 6 inches seeded topsoil and a gravel toe trench.

6. TAX LOSS

The anticipated tax loss for the Fort Fairfield Local Protection Project, based upon the 1986 tax assessments of the town is estimated to be approximately \$1,900.00 dollars, which was furnished by local town officials.

7. ACQUISITION COSTS

Acquisition costs will include costs mapping and surveys, legal description, title evidence, appraisals, negotiations, and closing and administrative costs for possible condemnations. The acquisition costs are based upon this office's experience in similar civil works projects in this general area and are estimated at \$3,000 per ownership.

19 OWNERSHIPS x \$3,000.00 = \$57,000.00

8. RELOCATION COSTS

Public Law 91-646, Uniform Relocations Assistance Act of 1970, provided for equitable treatment of persons displaced from their homes, businesses, or farms by a Federally Assisted Program. In accordance with this law, a sum of \$200 per ownership is estimated to cover possible reimbursable expenses incidental to transfer of real estate interests which may be incurred by the ownerships in this acquisition program.

Included among the items under PL 91-646 are the following:

- a. Moving Expenses
- b. Relocation allowance (Business)
- c. Replacement Housing (Tenants)
- d. Relocation Advisory Services
- e. Recording Fees
- f. Transfer Taxes
- g. Mortgage Prepayment Costs
- h. Real Estate Tax Refunds (Pro-Rata)

Preliminary surveys indicate that no relocation of existing residential and commercial properties will be required for the proposal project.

ESTIMATE OF THE RELOCATION COSTS

19 OWNERSHIPS X \$200.00 EACH = \$3,800.00

9. SEVERANCE DAMAGES

Severance damages usually occur when partial takings are acquired which restrict the remaining portion from full economic development. The severance damages are measured and estimated on the basis of a "Before" and "After" appraisal method and will reflect actual value loss incurred to the ownerships as a result of partial acquisition.

Preliminary investigation indicate that no ownership will incur severance damage because of the taking. The acquisition will be under Permanent Easements.

ESTIMATE OF SEVERANCE DAMAGES = -0-

10. PROTECTION AND ENHANCEMENT OF CULTURAL ENVIRONMENT

In accordance with instructions set forth in Teletype DA (DAEN) R 111306A, dated October 1971, Subject: "EO11593, 13 May 1971, Protection and Enhancement of Cultural Environment; and DA AR200-1 dated 15 July 1982; "our preliminary field investigations revealed that no local, State, Federally owned nor Federally controlled property of historical significance would fall within the provisions of EO11593 and AR200-1.

11. ZONING

The lands affected by the project are zoned commercial.

12. HIGHEST AND BEST USE

The highest and best use of the affected lands is considered to be the present use.

13. MINERAL DEPOSITS

A recent field inspection discloses no evidence of commercial mining or gravel nor the deposits of any minerals within the project area.

14. CROPS

Several trees have been killed off either by flood damage or disease. However, the quality and quantity of the healthy growth are considered inadequate to require inclusion of any special allowance for merchantable timber.

Agriculture - There is no evidence of any commercial agricultural efforts in the project area.

15. UTILITIES AND SERVICES

Electric power, telephone, Town water, and sanitary sewers are available to all properties within the project area.

16. WATER RIGHTS

Suggested interim guide lines for shore land zoning and subdivision control have been distributed to municipalities in Maine, and Department of Environmental Protection, State Planning Office. The guide lines are intended to assist communities with municipal shore land zoning.

All buildings and structures except those requiring direct access to the water as an operational necessity shall be set back at least 100 feet from the mean annual high water line.

Those standards may be waived by a municipality because of existing structures, and those requiring direct access to the water as an operational necessity. A recent inspection and discussion with the Town Manager revealed no ownerships in the project area require access to the River for their operational needs.

17. BORROW AREA

No land has been included in this report for borrow purposes.

18. RELOCATIONS - Roads and Public Utilities

No roads but public utilities (sewage) will require relocation. The main sanitary sewer which services this area of Fort Fairfield will be relocated in proposed Permanent Easement Area of this project.

19. CONTINGENCIES

A contingency allowance of 25 percent is considered to be reasonably adequate to provide for possible appreciation of property values from the time of this estimate to acquisition date, for possible minor property line adjustment or for additional hidden ownerships which may be developed by refinement of taking lines, for adverse condemnation awards and to allow for practical and realistic negotiations.

20. GOVERNMENT-OWNED FACILITIES

Section III of the Act of Congress approved 8 July 1958 (PL85-500) authorized the protection, realteration, reconstruction, relocation or replacement of Government-owned facilities. A preliminary inspection of the property area indicated no Government-owned facilities are affected.

21. RIGHTS TO BE ACQUIRED

Local interests are required to provide all lands, easements and rights-of-way necessary for project construction. Appraisals for acquisition will be received by this office.

22. FEE REQUIREMENTS

Preliminary investigations indicate that both improved and unimproved properties will be affected by the proposed Fort Fairfield Local Flood Control Project. Based on Project Engineering Plans, one fee acquisition will be required of the project. Lot 29 consisting of .37± acres of land (16,117 SF) owned by Pineland Development Corporation will be acquired in fee.

Therefore, the fee acquisitions that are necessary for the subject project are estimated as follows:

EEE ACQUISITIONS

LAND .37± acres (16,117 SF x \$.60 PSF)	=	\$ 9,670.20
Call		\$ 9,700.00

23. EASEMENT AREAS

A. Permanent Easement Areas

Permanent easements for construction and maintenance purposes are necessary. The easement areas adjacent to the waterway vary in width throughout the project area and contain approximately 4.06± acres.

Preliminary investigations indicate that after the imposition of the permanent easement interests adjacent to the waterway, their highest and best use of the remainder of the properties will not be materially affected. However, lands would remain in their private ownerships to maintain conformity with their existing lot requirements.

The following costs for the permanent easement interests are considered fair and reasonable for imposition of the 4.06± acre easement areas.

4.06± acres @ \$29,000 per acre	=	\$116,870.00
---------------------------------	---	--------------

B. Temporary Easement Areas

Construction measures would require temporary easements for contractor work areas along the entire length of the dike. The required work areas will be about 35 feet wide and will run contiguous to the inboard toe of the proposed dike length of 2,900 feet. Exceptions to their contiguity are at certain points where their close proximity to existing structure. In these cases, the structures will not be affected. The easements would affect about 16 private ownerships, and two municipally owned parcels.

It is estimated that about 2.33 acres will be required for right-of-way and temporary construction easements. Right-of-ways to the proposed dike and pumping station will be situated on town-owned land which are included in the proposed project. The cost for temporary construction easements is estimated to be about 10 percent (10%) of the estimated market value of the land per year. This amount is predicated on an amount equal to the estimated fair return an investor would be entitled to on invested capital and

provision for economic tax. For purposes of this report, it is estimated that the temporary construction easements will be required for one year.

2.33± acres @ \$29,000 per acre	\$67,570.00
Fair rate of return at 10% per year (for one-year)	$\frac{\text{---} \times 10\%}{\text{---}}$
	\$ 6,757.00

24. EXISTING FLOWAGE EASEMENTS

The Maine and New Brunswick Electrical Power Company Limited constructed a dam about 1908, known as Tinker Dam, downstream from Fort Fairfield on the Aroostook River in New Brunswick, Canada.

Since the dam was constructed, there have been 70 or more flood damage claims filled with the power company alleging the damage was due to the fact that the dam caused the flooding. According to records of the power company, when these claims were settled they attempted to secure flowage easements over these properties. At least in some cases they were able to secure a flowage easement which reads in part:

"The right in perpetuity to flow from time to time as the needs of the Grantee, its successors and assigns may require to such heights as they may be flowed by the maintenance of the Grantee's existing dam at Tinker in the said Province of New Brunswick at its present elevation with flashboards at the level of 498 as established by a brass plug in the cutoff wall of the head works of said dam, the Grantors' premises situated in said Fort Fairfield bounded and described as..."

Pending a detailed title examination of each ownership involved, it would be difficult to identify which ownerships have flowage easements to the extent thereof.

25. EVALUATION AND CONCLUSION

A thorough search of the records was made in the Town of Fort Fairfield, Maine to obtain comparable sales data. In addition real estate brokers, local officials, and knowledgeable persons were interviewed to obtain data and value estimates. This evaluation is based upon the knowledge of the general real estate market in the area which was obtained from this study and analysis. All of the properties affected within the project area have been inspected from the exterior. A random sample of interiors were also inspected when owners were interviewed.

The trend of property values in the Town of Fort Fairfield appear to be static as evidenced by the few new construction starts and limited real estate transfers. For the most part, business properties and commercial establishments that are affected by the proposed project purchase area have remained in the same family ownerships for many years.

The assigned values used in this estimate are for the most part considered nominal which reflect both small and large tracts of land with differing characteristics. Based on this fact real estate market values are estimated at \$29,000.00 per acre, with a square foot market value of \$.60 PSF, due to its characteristics.

26. GROSS APPRAISAL

The following is a summary of the real estate required; its estimated market value:

EEE

IMPROVEMENTS

None

-0-

LAND

0.37± Acre	Commercial Land	
	(16,117 SF @ \$.60 PSF)	\$ 9,670.20
Total 0.37± Acre	Cost Land & Improvements (Fee)	9,670.20
	Call	\$ 9,700.00

PERMANENT EASEMENT

4.06± Acres	Commercial Land	
	@ \$29,000 per acre	\$116,870.00
Total 4.06± Acres	Cost Land (Permanent Easement)	116,870.00

TEMPORARY EASEMENT

2.33± acres @ \$29,000 per acre	\$ 67,570.00
Fair rate of return at 10% per year (for one-year)_____x_10%	
Total 2.33± Acres	Cost Land (Temporary Easement) \$ 6,757.00

COSI SUMMARY

The following is a summary of the total estimated real estate costs of the proposed project:

Total Cost 13.18 Acres Land & Improvements (Fee, Permanent & Temporary Easements)	\$133,327.00
Severance Damages	-0-
Relocation Assistance	\$ 3,800.00
Acquisition Costs	\$ 57,000.00
Contingency Allowance (25%)	\$ 33,163.00
TOTAL ESTIMATED REAL ESTATE COSTS	\$227,290.00
ROUNDED TO	\$227,000.00

ADDENDA

COMPARABLE SALES - FORT FAIRFIELD & ARROSTOOK COUNTY, MAINE

SALES NUMBER	DATE OF SALE	LOCATION	GRANOR	GRANTEE	LAND AREA	ZONING	PRICE
1	Dec. 1986	Ft. Fairfield, ME	W. Adams	K. Thibeau	1.43±	Comm.	\$29,800.00
2	Aug. 1985	Caribou, ME	M. Carter	R. Deschene	1.0±	Comm.	\$37,000.00
3	Aug. 1986	Ft. Fairfield, ME	Dupree Realty Trust	D. Wilcox	1.0±	Comm.	\$29,000.00
4	Apr. 1986	Presque Isle, ME	L. Roberts	C. Walton	1.06±	Comm.	\$25,000.00